

### STATEMENT OF SUBSTANCE OF INTERVIEW

This application has been reviewed in light of the Office Action dated February 19, 2010. Claims 26 to 53 are presented for examination, of which Claims 26, 46, and 47, are in independent form. Claim 48 to 53 have been added. Favorable reconsideration and further prosecution are requested.

The Examiner is thanked for the courtesies extended during the telephonic interview held on May 14, 2010 to discuss the rejection of Claim 26 under 35 U.S.C. §103(a). It is believed that this response, in conjunction with the Interview Summary issued by the Examiner, represents a complete written statement as to the substance of the interview, in accordance with M.P.E.P. § 713.04.

Claims 26 to 28, 35, and 38 to 47 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 6,498,355 (Harrah et al.; hereinafter "Harrah"); and Claims 29 to 34 were rejected as being unpatentable over Harrah, and further in view of U.S. Pat. Appln. Pub. 2004/0065894 (Hashimoto et al.; hereinafter "Hashimoto"). Applicants respectfully traverse the rejection of the claims and submit that independent Claims 26, 46, and 47, together with the remaining claims dependent therefrom, are patentably distinct from the applied art for at least the following reasons.

Claim 26 is directed to a light-emitting diode arrangement. The arrangement includes a light-emitting diode chip and a multi-layer board having a base of a thermally well-conducting material that includes a metal. The base is a core of the board and is configured for heat dissipation. The arrangement also includes an electrically insulating and thermally conducting connection layer positioned between an emission surface of the

light-emitting diode chip and the board. Between the light-emitting diode chip and the base of the board there is arranged an intermediate carrier separate from parts with which the light-emitting diode chip is electrically contacted. The intermediate carrier includes an aluminum nitride substrate.

Among other notable features of Claim 26 are that the arrangement includes an electrically insulating and thermally conducting connection layer between an emission surface of the light-emitting diode chip and the board and that the intermediate carrier includes an aluminum nitride substrate. As noted at page 4 of the specification, "Since in contrast to the state of the art, the thermally insulating (epoxide) layer is not required, the heat transfer from the light emitting diode chip to the heat dissipating base material of the board is significantly improved." Accordingly, by virtue of this feature of an electrically insulating and thermally conducting connection layer, the thermal resistance of heat flowing from the LED can be reduced. Also, electricity consumption can be reduced.

Moreover, it is noted in the last paragraph of page 12 of the specification, that an advantage of using an intermediate carrier having an aluminum nitride substrate is that a higher electrostatic discharge resistance is attained and the metal core board remains electrically neutral.

Harrah relates to light emitting diodes and arrays of light emitting diodes. As understood by Applicants, Harrah teaches an LED arrangement that includes a metal substrate 6 that is said to spread and dissipate heat flowing from an LED. (See, e.g., Harrah at column 4, lines 14 and 15 and column 5 lines 15, 16, 54 and 55.) According to Harrah, the combination of solder bumps 32, submount 30, thermal contact 46, and thermally

conductive material 24 allegedly provides a low thermal-resistance path for heat to flow from an LED 28 to a metal substrate 6. See, e.g., Harrah, at column 5, lines 13 to 16. The structures described in Harrah require a complex layering arrangement in comparison to the claimed arrangements. The complex structures in Harrah are caused primarily by the use of an electrically conducting material (i.e., metal pad) for thermal contact 46. This additional metal pad increases the thermal resistance of the heat flow path. In addition the provision of such a thermal contact 46 requires the provision of an additional dielectric layer 48.

The Office Action concedes that “Harrah is silent as to the intermediate carrier includes an aluminum nitride substrate”. Office Action, at page 3, lines 17 and 18. However, the Office Action argues that “it would have been obvious to a person of ordinary skill in the art at the time of the invention was made to employ an aluminum nitride substrate as intermediate carriers when good electrically insulating and thermally conductive properties are wished for.” Office Action, at page 3, lines 19 to 22. Applicants respectfully disagree with the premise for this assertion.

According to the premise in the Office Action, aluminum nitride would have been obvious when certain properties are “wished for”. No evidence is cited to indicate that Harrah somehow “wished for” these properties for his submount 30. Clearly, Harrah does not “wish for” the claimed property of electrical insulation, for the reason that Harrah discloses electrically conductive materials for his submount 30. See Harrah at column 4, line 51, “a conductive material such as silicon”. Likewise, Harrah nowhere mentions a “wish for” his submount 30 to exhibit the claimed property of thermal conductivity.

These failings of Harrah represent a gap in the reasoning applied by the Office, such that the rejection over Harrah should be withdrawn.

Moreover, the Office Action apparently relies upon Official Notice of those features of Claim 26 which are conceded as not being taught by Harrah, i.e., an aluminum nitride substrate. Applicants note that MPEP 2144.03 states, in part, that “It is never appropriate to rely solely on ‘common knowledge’ in the art without evidentiary support in the record, as the principal evidence upon which a rejection was based. *Zurko*, 258 F.3d at 1385, 59 USPQ2d at 1697.” Accordingly, Applicants respectfully request that the Office provide the required documentary evidence showing the alleged elements of the claims that are conceded as not being taught by Harrah.

Also, Applicants submit that the rejection of Claim 26 is improper under 35 U.S.C. § 103(a). According to MPEP 2143(A) to reject a claim based on a rationale of combining prior art elements according to known methods to yield predictable results, the Office must at least articulate four (4) elements: (1) a finding that the prior art included each element claimed, although not necessarily in a single prior art reference, with the only difference between the claimed invention and the prior art being the lack of actual combination of the elements in a single prior art reference; (2) a finding that one of ordinary skill in the art could have combined the elements as claimed by known methods, and that in combination, each element merely performs the same function as it does separately; (3) a finding that one of ordinary skill in the art would have recognized that the results of the combination were predictable; and (4) whatever additional findings based on

the Graham factual inquiries may be necessary, in view of the facts of the case under consideration, to explain a conclusion of obviousness.

Applicants submit that the Office Action does not articulate all of these elements as required. In particular, the Office Action asserts, based only on Official Notice, that an aluminum nitride substrate was somehow “wished for”.

Accordingly, Applicants submit that Claim 26 is patentable over Harrah and respectfully request withdrawal of the rejection under 35 U.S.C. § 103(a).

Independent Claim 46 is directed to a light-emitting diode arrangement. The light-emitting diode arrangement includes a light-emitting diode chip, a multi-layer board having a base of a thermally well-conducting layer, the layer including a metal, the base being a core of the board and configured for heat dissipation. The light-emitting diode arrangement also includes an electrically insulating and thermally conducting connection layer between an emission surface of the light-emitting diode chip and the board. Between the light-emitting chip and the base of the board there is arranged an intermediate carrier separate from parts with which the light-emitting diode chip is electrically contacted. A colour conversion material is arranged above and alongside the light-emitting diode chip.

Among other notable features of Claim 46 is that a colour conversion material is arranged above and alongside the light-emitting diode chip. The Office Action concedes that Harrah does not teach this feature of Claim 46 and instead relies on Official Notice for this feature. Moreover, the Office Action asserts that it would have been obvious to employ the colour conversion material as recited in Claim 46 as a matter of obvious design choice. Applicants submit that reliance on Official Notice in rejecting

Claim 46 is improper and respectfully request that the Office provide documentary evidence showing the features that are conceded as not being taught by Harrah. Moreover, Applicants submit that Office Action has not established any support for the argument that the Officially Noticed colour conversion material would be suitable for its intended use as alleged in the Office Action. Accordingly, Applicants respectfully request that the Office provide some rationale as to why one of general skill of a worker in the art would select the colour conversion material and use it as specified in Claim 46.

Accordingly, Applicants submit that Claim 46 is patentable over Harrah and respectfully request withdrawal of the rejection under 35 U.S.C. § 103(a).

Claim 47 is directed to a light-emitting diode arrangement, comprising a light-emitting diode chip and a multi-layer board having a base of a thermally well-conducting layer. The layer includes a metal, the base being a core of the board and configured for heat dissipation. The light-emitting diode arrangement also includes an electrically insulating and thermally conducting connection layer between an emission surface of the light-emitting diode chip and the board. Between the light-emitting chip and the base of the board there is arranged an intermediate carrier separate from parts with which the light-emitting diode chip is electrically contacted. Also, the light-emitting diode chip is arranged on the intermediate carrier using a conductive adhesive.

Among other notable features of Claim 47 is that the light-emitting diode chip is arranged on the intermediate carrier using a conductive adhesive. The Office Action argues that solder used between the LED 28 and the submount 30 in Harrah corresponds to conductive adhesive. As discussed above, Harrah relies on solder bumps 32 and solder to

connect LED 28 to submount 30, and does not rely on a conductive adhesive. See, e.g., Harrah, at column 5, lines 13 to 16.

Accordingly, Applicants submit that Claim 47 is patentable over Harrah and respectfully request withdrawal of the rejection under 35 U.S.C. § 103(a).

The other claims in this application depend from one or another of Claims 26, 46 and 47 and therefore are submitted to be patentable for at least the same reasons.

In particular, Applicants note that Claims 48 to 50 are directed to a light-emitting diode arrangement, wherein there is no electrically conducting layer between the intermediate carrier and the multi-layer board. By virtue of this arrangement, the construction of the intermediate carrier already provides adequate heat transfer characteristics and electrical isolation so that, in the context of Claims 48 to 50, no additional electrically conducting layer is needed. As discussed above, the structure of Harrah includes the electrically conductive thermal contact 46 (e.g., metal pad) between the submount 30 and the metal substrate 6. Accordingly, Applicants believe that Claims 48 to 50 are allowable over Harrah.

Likewise, Claims 51 to 53 are intended to recite the ordering of the intermediate carrier and the electrically insulating and thermally conducting connection layer, relative to the base of the board and the light-emitting diode chip.

Because each dependent claim also is deemed to define an additional aspect of the invention, however, individual consideration or reconsideration, as the case may be, of the patentability of each claim on its own merits is respectfully requested.

This Amendment After Final Action is believed clearly to place this application in condition for allowance and, therefore, its entry is believed proper under 37 C.F.R. § 1.116. Accordingly, entry of this Amendment After Final Action, as an earnest effort to advance prosecution and reduce the number of issues, is respectfully requested. Should the Examiner believe that issues remain outstanding, it is respectfully requested that the Examiner contact Applicants' undersigned attorney in an effort to resolve such issues and advance the case to issue.

In view of the foregoing amendments and remarks, Applicants respectfully request favorable reconsideration and an early passage to issue of the present application.



Applicants' undersigned attorney may be reached in our Costa Mesa, California office by telephone at (714) 540-8700. All correspondence should continue to be directed to our below listed address.

Respectfully submitted,

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